



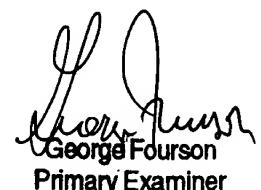
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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/851,313	05/09/2001	Tatsuya Usami	NEC01P069-MSb	2820
21254	7590	06/24/2004	EXAMINER	
MCGINN & GIBB, PLLC 8321 OLD COURTHOUSE ROAD SUITE 200 VIENNA, VA 22182-3817			MALDONADO, JULIO J	
			ART UNIT	PAPER NUMBER
			2823	

DATE MAILED: 06/24/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

<b>Interview Summary</b>	Application No.	<b>Applicant(s)</b>	
	09/851,313	USAMI, TATSUYA <i>(initials)</i>	
	Examiner Julio J. Maldonado	Art Unit 2823	
<p>All participants (applicant, applicant's representative, PTO personnel):</p> <p>(1) <u>Julio J. Maldonado</u>. (3) _____.</p> <p>(2) <u>Fred Zimmerman</u>. (4) _____.</p> <p>Date of Interview: <u>18 June 2004</u>.</p> <p>Type: a)<input checked="" type="checkbox"/> Telephonic b)<input type="checkbox"/> Video Conference c)<input type="checkbox"/> Personal [copy given to: 1)<input type="checkbox"/> applicant 2)<input type="checkbox"/> applicant's representative]</p> <p>Exhibit shown or demonstration conducted: d)<input type="checkbox"/> Yes e)<input checked="" type="checkbox"/> No. If Yes, brief description: _____.</p> <p>Claim(s) discussed: <u>38</u>.</p> <p>Identification of prior art discussed: _____.</p> <p>Agreement with respect to the claims f)<input checked="" type="checkbox"/> was reached. g)<input type="checkbox"/> was not reached. h)<input type="checkbox"/> N/A.</p> <p>Substance of Interview including description of the general nature of what was agreed to if an agreement was reached, or any other comments: <u>See Continuation Sheet</u>.</p> <p>(A fuller description, if necessary, and a copy of the amendments which the examiner agreed would render the claims allowable, if available, must be attached. Also, where no copy of the amendments that would render the claims allowable is available, a summary thereof must be attached.)</p> <p><b>THE FORMAL WRITTEN REPLY TO THE LAST OFFICE ACTION MUST INCLUDE THE SUBSTANCE OF THE INTERVIEW. (See MPEP Section 713.04). If a reply to the last Office action has already been filed, APPLICANT IS GIVEN ONE MONTH FROM THIS INTERVIEW DATE, OR THE MAILING DATE OF THIS INTERVIEW SUMMARY FORM, WHICHEVER IS LATER, TO FILE A STATEMENT OF THE SUBSTANCE OF THE INTERVIEW. See Summary of Record of Interview requirements on reverse side or on attached sheet.</b></p> <div style="text-align: right; margin-top: 20px;">   <b>George Fourson</b>  Primary Examiner </div> <p>Examiner Note: You must sign this form unless it is an Attachment to a signed Office action.</p> <p>Examiner's signature, if required</p>			

## Summary of Record of Interview Requirements

### **Manual of Patent Examining Procedure (MPEP), Section 713.04, Substance of Interview Must be Made of Record**

A complete written statement as to the substance of any face-to-face, video conference, or telephone interview with regard to an application must be made of record in the application whether or not an agreement with the examiner was reached at the interview.

### **Title 37 Code of Federal Regulations (CFR) § 1.133 Interviews**

#### **Paragraph (b)**

In every instance where reconsideration is requested in view of an interview with an examiner, a complete written statement of the reasons presented at the interview as warranting favorable action must be filed by the applicant. An interview does not remove the necessity for reply to Office action as specified in §§ 1.111, 1.135. (35 U.S.C. 132)

#### **37 CFR §1.2 Business to be transacted in writing.**

All business with the Patent or Trademark Office should be transacted in writing. The personal attendance of applicants or their attorneys or agents at the Patent and Trademark Office is unnecessary. The action of the Patent and Trademark Office will be based exclusively on the written record in the Office. No attention will be paid to any alleged oral promise, stipulation, or understanding in relation to which there is disagreement or doubt.

The action of the Patent and Trademark Office cannot be based exclusively on the written record in the Office if that record is itself incomplete through the failure to record the substance of interviews.

It is the responsibility of the applicant or the attorney or agent to make the substance of an interview of record in the application file, unless the examiner indicates he or she will do so. It is the examiner's responsibility to see that such a record is made and to correct material inaccuracies which bear directly on the question of patentability.

Examiners must complete an Interview Summary Form for each interview held where a matter of substance has been discussed during the interview by checking the appropriate boxes and filling in the blanks. Discussions regarding only procedural matters, directed solely to restriction requirements for which interview recordation is otherwise provided for in Section 812.01 of the Manual of Patent Examining Procedure, or pointing out typographical errors or unreadable script in Office actions or the like, are excluded from the interview recordation procedures below. Where the substance of an interview is completely recorded in an Examiners Amendment, no separate Interview Summary Record is required.

The Interview Summary Form shall be given an appropriate Paper No., placed in the right hand portion of the file, and listed on the "Contents" section of the file wrapper. In a personal interview, a duplicate of the Form is given to the applicant (or attorney or agent) at the conclusion of the interview. In the case of a telephone or video-conference interview, the copy is mailed to the applicant's correspondence address either with or prior to the next official communication. If additional correspondence from the examiner is not likely before an allowance or if other circumstances dictate, the Form should be mailed promptly after the interview rather than with the next official communication.

The Form provides for recordation of the following information:

- Application Number (Series Code and Serial Number)
- Name of applicant
- Name of examiner
- Date of interview
- Type of interview (telephonic, video-conference, or personal)
- Name of participant(s) (applicant, attorney or agent, examiner, other PTO personnel, etc.)
- An indication whether or not an exhibit was shown or a demonstration conducted
- An identification of the specific prior art discussed
- An indication whether an agreement was reached and if so, a description of the general nature of the agreement (may be by attachment of a copy of amendments or claims agreed as being allowable). Note: Agreement as to allowability is tentative and does not restrict further action by the examiner to the contrary.
- The signature of the examiner who conducted the interview (if Form is not an attachment to a signed Office action)

It is desirable that the examiner orally remind the applicant of his or her obligation to record the substance of the interview of each case. It should be noted, however, that the Interview Summary Form will not normally be considered a complete and proper recordation of the interview unless it includes, or is supplemented by the applicant or the examiner to include, all of the applicable items required below concerning the substance of the interview.

A complete and proper recordation of the substance of any interview should include at least the following applicable items:

- 1) A brief description of the nature of any exhibit shown or any demonstration conducted,
- 2) an identification of the claims discussed,
- 3) an identification of the specific prior art discussed,
- 4) an identification of the principal proposed amendments of a substantive nature discussed, unless these are already described on the Interview Summary Form completed by the Examiner,
- 5) a brief identification of the general thrust of the principal arguments presented to the examiner,  
(The identification of arguments need not be lengthy or elaborate. A verbatim or highly detailed description of the arguments is not required. The identification of the arguments is sufficient if the general nature or thrust of the principal arguments made to the examiner can be understood in the context of the application file. Of course, the applicant may desire to emphasize and fully describe those arguments which he or she feels were or might be persuasive to the examiner.)
- 6) a general indication of any other pertinent matters discussed, and
- 7) if appropriate, the general results or outcome of the interview unless already described in the Interview Summary Form completed by the examiner.

Examiners are expected to carefully review the applicant's record of the substance of an interview. If the record is not complete and accurate, the examiner will give the applicant an extendable one month time period to correct the record.

#### **Examiner to Check for Accuracy**

If the claims are allowable for other reasons of record, the examiner should send a letter setting forth the examiner's version of the statement attributed to him or her. If the record is complete and accurate, the examiner should place the indication, "Interview Record OK" on the paper recording the substance of the interview along with the date and the examiner's initials.

Continuation of Substance of Interview including description of the general nature of what was agreed to if an agreement was reached, or any other comments: In a telephonic conversation, attorney of record, Fred immerman pointed out that the last Office Action lacked rejection of claim 38 and agreed to receive an interview summary pointing out where in the last Office Action claim 38 was rejected. Therefore, as requested, claim 38 is rejected under 35 U.S.C. 103(a) in view of Lou ('732) and the prior art, item 7 of the Office Action. A copy of the Office Action including the rejection of claim 38 is included as an attachment to the interview summary..

**ATTACHMENT TO INTERVIEW SUMMARY**

**DETAILED ACTION**

1. The final rejection as set forth in paper mailed on 05/24/2003 is withdrawn in view of applicants' amendments.
2. A new rejection is included in the application.
3. Claims 1, 2, 4-6, 8 and 31-46 are pending in the present application.

***Claim Rejections - 35 USC § 102***

4. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

5. Claims 1, 2, 4-6, 8, 31, 34, 37, 41, 42 and 44 are rejected under 35 U.S.C. 102(e) as being anticipated by Lou (U.S. 6,277,732 B1).

In reference to claims 1, 4, 5, 8, 41 and 42, Lou (Figs.1A, 1B, 1D and 1E) teaches damascene interconnect including a multilayered insulation film, wherein said multilayered insulation film comprises a first insulation layer (208) comprising an organic material having a dielectric constant which is lower than a silicon oxide dielectric constant; a second insulation layer (210) comprising a polysiloxane compound having an Si-H group and formed on and adhering to a top of said first insulation layer (208); a third insulation layer (212) made of silicon oxide and formed on and adhering to a top of

said second insulation layer (210); and a conductive wire (216, 218) embedded in a groove formed in said multi-layered insulation film, said multi-layered insulation film being disposed between said wire (216, 218), wherein said second insulation layer (210) comprises a hydride organosiloxane (column 3, line 5 – column 4, line 60).

Although Lou does not expressly disclose forming a plurality of grooves, this feature is seen to be inherent because the interconnection structure of Fig.1E would have multiple vias as the interconnection structure is continuously showing.

In reference to claims 2 and 6, Lou teaches wherein said first insulation layer comprises spin on glass materials such as aromatic-containing organic resins (column 3, lines 43 – 45).

In reference to claim 31, Lou teaches wherein said dielectric constant of said first insulation layer is no greater than 3.5 (column 4, lines 43 – 45).

In reference to claim 34, Lou teaches wherein said first insulation layer comprises a thickness greater than a thickness of said second insulation layer; and wherein said first insulation layer comprises a thickness greater than a thickness of said third insulation layer (Fig.1D).

In reference to claim 37, Lou teaches wherein a bottom of said groove is formed on a same surface as said first insulation layer (Fig.1E).

In reference to claim 44, Lou teaches wherein a surface of said multi-layered film is substantially coplanar with a surface of said plurality of wires (Fig.1E).

***Claim Rejections - 35 USC § 103***

6. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

7. Claims 32, 36 and 38 are rejected under 35 U.S.C. 103(a) as being unpatentable over Lou (U.S. 6,277,732 B1) as applied to claims 1, 2, 4-6, 8, 31, 34, 37, 41, 42 and 44 above, and further in view of The Applicants Admitted Prior Art.

Lou substantially teaches all aspects of the invention including a first dielectric layer comprised of spin on glass (SOG) materials, but fails to disclose wherein said SOG are organopolysiloxane including methyl silsesquioxane (MSQ); and wherein said plurality of wires comprise copper wires. However, the prior art teaches using SOG materials as dielectric layer, wherein said SOG materials include methyl silsesquioxane; and forming copper wires (Instant page 2, lines 5 – 8 and page 5, lines 9 – 24).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to combine the teachings of Lou and the prior art to substitute the SOG material taught by Lou for the SOG material disclosed by the prior art because using MSQ reduces crosstalk between metal wires (Instant page 2, lines 12 – 15). It would also have been within the scope of one of ordinary skill in the art to combine the teachings of Lou and the prior art to enable the forming wire step of Lou to be performed according to the teachings of the prior art because one of ordinary skill in the art at the time the invention was made would have been motivated to look to alternative

suitable methods of performing the disclosed forming wire step of Lou and art recognized suitability for an intended purpose has been recognized to be motivation to combine. MPEP 2144.07.

8. Claim 33 is rejected under 35 U.S.C. 103(a) as being unpatentable over Lou (U.S. 6,277,732 B1) as applied to claims 1, 2, 4-6, 8, 31, 34, 37, 41, 42 and 44 above, and further in view of Aoi (U.S. 6,333,257 B1).

Lou teaches all aspects of the invention including a first dielectric layer selected from a material including fluorinated polyimide but fail to teach using first insulation layer comprising polyaryl ether. However, Aoi (Figs.4a-11c) teaches a multilayered insulation film having wiring embedded therein, wherein interlayer insulation layer (204) comprises any arbitrary material such as fluorinated polyimide and polyaryl ether (column 10, lines 1 – 11). It would have been within the scope of one of ordinary skill in the art to combine the teachings of Lou and Aoi to enable using the dielectric materials of Aoi in Lou because one of ordinary skill in the art at the time the invention was made would have been led to the conclusion that the selection of known materials based on its suitability for its intended use supported a *prima facie* obviousness. MPEP 2144.07.

9. Claim 35 is rejected under 35 U.S.C. 103(a) as being unpatentable over Lou (U.S. 6,277,732 B1) as applied to claims 1, 2, 4-6, 8, 31, 34, 37, 41, 42 and 44 above, and further in view of Yau et al. (U.S. 6,072,227).

Lou teaches a multilayered insulation film including an adhesive layer (210) between two interlayer dielectrics (208, 212) but fails to disclose wherein said adhesive

layer comprises a first layer and a second layer placed in said first layer. However, You et al. (Figs.8H and 10H) teach a damascene structure comprising a multilayered insulation film, wherein said multilayered insulation film comprises a first dielectric layer (710) that can be made of an organic material having a dielectric constant which is lower than a silicon oxide dielectric constant (column 14, lines 10 – 14); a second dielectric layer (714, 716, 718) comprising an oxidized organic silane layer (column 14, lines 20 – 22); and a third dielectric layer (722) that can be made of an inorganic material (column 13, lines 9 – 13), wherein said adhesive layer comprises a first layer (714) and a second layer (718) placed in said first layer, wherein said first (714) and said second (718) layer are made from the same material (column 13, line 9 – column 14, line 59). It would have been within the scope of one of ordinary skill in the art to combine the teachings of Lou and Yau et al. to enable the second dielectric layer of Lou to be comprised of more than one layer according to the teachings of Yau et al. because it is *prima facie* obvious to combine two compositions each of which is taught by the prior art to be useful for the same purpose, in order to form a third composition to be used for the very same purpose (MPEP 2144.06).

10. Claims 39, 40, 45 and 46 are rejected under 35 U.S.C. 103(a) as being unpatentable over Lou (U.S. 6,277,732 B1) as applied to claims 1, 2, 4-6, 8, 31, 34, 37, 41, 42 and 44 above, and further in view of Allada et al. (U.S. 6,218,317 B1) and Wolf et al. (*Silicon Processing for the VLSI Era, Volume 1*) alone or in combination with Chen et al. (*Effects of slurry formulations on chemical-mechanical polishing of low dielectric constant polysiloxanes: hydrido-organo siloxane and methyl silsesquioxane*).

Lou teaches a second insulation comprising hydrogen silsesquioxane and methyl silsesquioxane, but fails to teach using a methylated hydrogen silsesquioxane film (MHSQ) at a thickness of about 50nm, wherein said dielectric layer includes repeating units of  $(SiCH_3O_2)_n$ ,  $(SiO_2H)_n$  and  $(SiO_3)_n$ , wherein a molar ratio of  $(SiO_2H)_n$  to a total of said repeating units is at least 0.2, and wherein said dielectric layer is deposited by plasma CVD. However, Allada et al. (Figs.1a-1b) in a related art to the formation of an interconnect structure teach a second insulating film comprising a methylated hydrido organo siloxane polymer (HOSP), wherein said polymer can be formed by spin coating processes or by conventional CVD processes (column 2, lines 7 – 67).

Furthermore, according to Chen (Fig.1), methylated hydrido organo siloxane polymer (HOSP) includes repeating units of  $(SiCH_3O_2)_n$ ,  $(SiO_2H)_n$  and  $(SiO_3)_n$ , wherein a molar ratio of  $(SiO_2H)_n$  to a total of said repeating units is at least 0.2.

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention was made to use the insulating layer as taught by Allada et al. in the interconnect formation structure of Lu et al., since this dielectric layers exhibit low dielectric constants (Allada et al., column 2, lines 36-48).

Still, the combined structure of Lou and Allada fail to teach the dielectric layer having a thickness of about 50nm. Notwithstanding, it would have been an obvious matter of design choice bounded by well known manufacturing constraints and ascertainable by routine experimentation and optimization to choose these particular dimensions because applicant has not disclosed that the dimensions are for a particular unobvious purpose, produce an unexpected result, or are otherwise critical, and it

appears *prima facie* that the process would possess utility using another dimension. Indeed, it has been held that mere dimensional limitations are *prima facie* obvious absent a disclosure that the limitations are for a particular unobvious purpose, produce an unexpected result, or are otherwise critical. See, for example, *In re Rose*, 220 F.2d 459, 105 USPQ 237 (CCPA 1955); *In re Rinehart*, 531 F.2d 1048, 189 USPQ 143 (CCPA 1976); *Gardner v. TEC Systems, Inc.*, 725 F.2d 1338, 220 USPQ 777 (Fed. Cir. 1984), cert. denied, 469 U.S. 830, 225 USPQ 232 (1984); *In re Dailey*, 357 F.2d 669, 149 USPQ 47 (CCPA 1966).

Furtherstill, the combined teachings of Lou and Allada et al. fail to teach wherein said conventional CVD processes include plasma CVD. However, according to Wolf et al., conventional CVD processes known in the art includes low pressure CVD and plasma CVD (pages 168 – 174). It would have been within the scope of one of ordinary skill in the art to combine the teachings of Lou and Allada et al. with the teachings of Wolf et al. to enable the deposition step of Lou and Allada et al. to be performed according to the teachings of Wolf et al. because one of ordinary skill in the art at the time the invention was made would have been motivated to look to alternative suitable methods of performing the disclosed deposition step of Lou and Allada et al. and art recognized suitability for an intended purpose has been recognized to be motivation to combine. MPEP 2144.07.

11. Claim 43 is rejected under 35 U.S.C. 103(a) as being unpatentable over Lou (U.S. 6,277,732 B1) as applied to claims 1, 2, 4-6, 8, 31, 34, 37, 41, 42 and 44 above, and further in view of Lu et al. (U.S. 6,008,540).

Lou substantially teaches all aspects of the invention but fails to disclose wherein said first insulation layer, said second insulation layer and said third insulation layer of said multi-layered insulation film comprise substantially uniform widths. However, Lu et al. (Figs.2b and 3f) teach an interconnect structure comprising a multi-layered insulation film formed on a semiconductor substrate (102), said multi-layered insulation film comprising a first insulation layer comprising an organic material (342, and column 1, lines 24 – 33) having a dielectric constant which is lower than a silicon oxide dielectric constant; a second insulation layer (344) comprising a polysiloxane compound having an Si-H group and formed on and adhering to a top of said first insulation layer (342); a third insulation layer (346) comprising an inorganic material and formed on and adhering to a top of said second insulation layer (344); and a plurality of wires embedded in a groove formed in said multi-layered insulation film, said multi-layered insulation film being disposed between said wires, said first insulation layer, said second insulation layer and said third insulation layer of said multi-layered insulation film comprise either uniform or non-uniform widths (column 3, line 48 – column 6, line 62).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to combine the teachings of Lou and Lu et al. to enable the dielectric layers of Lou to be configured according to the teachings of Lu et al. because it would be a matter of choice which a person of ordinary skill in the art would have found obvious absent persuasive evidence that a particular configuration was significant. MPEP 2144.04, IV, B.

***Response to Arguments***

12. Applicant's arguments with respect to claims 1, 2, 4-6, 8 and 31-46 have been considered but are moot in view of the new ground(s) of rejection.

***Conclusion***

13. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

14. Any inquiry concerning this communication or earlier communications from the examiner should be directed to examiner Julio J. Maldonado whose telephone number is (571) 272-1864. The examiner can normally be reached on Monday through Friday.

15. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Olik Chaudhuri, can be reached on (571) 272-1855. The fax number for this group is 703-872-9306 for before final submissions, 703-872-9306 for after final

submissions and the customer service number for group 2800 is (703) 306-3329.

Updates can be found at <http://www.uspto.gov/web/info/2800.htm>.

Julio J. Maldonado  
Patent Examiner  
Art Unit 2823

Julio J. Maldonado

June 11, 2004